AM Objective #17: Find inverses of functions

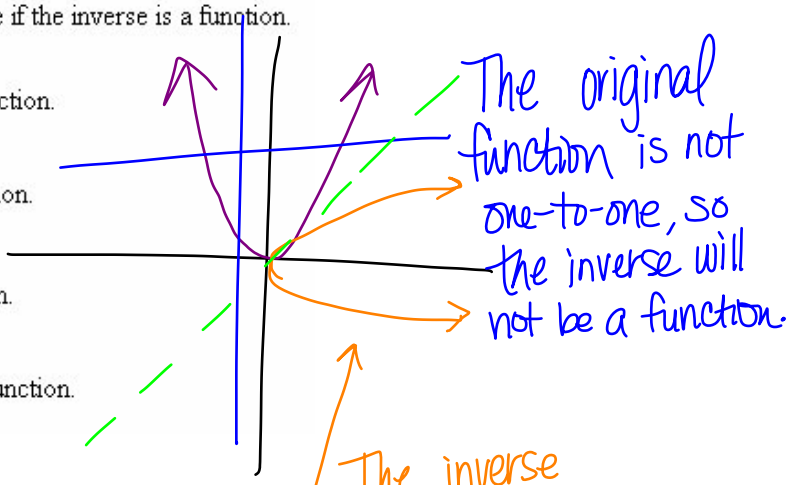
1. Find the inverse of $f(x) = 17x^2$. Determine if the inverse is a function.

[A] $f^{-1}(x) = \pm\sqrt{\frac{x}{17}}$, $f^{-1}(x)$ is not a function.

[B] $f^{-1}(x) = \pm\frac{1}{17}\sqrt{x}$, $f^{-1}(x)$ is a function.

[C] $f^{-1}(x) = \pm\sqrt{\frac{x}{17}}$, $f^{-1}(x)$ is a function.

[D] $f^{-1}(x) = \pm\frac{1}{17}\sqrt{x}$, $f^{-1}(x)$ is not a function.



The original function is not one-to-one, so the inverse will not be a function.

① Switch x and y

$y = 17x^2$

$x = 17y^2$

② Solve for y

$\frac{x}{17} = \frac{17y^2}{17}$

$\sqrt{\frac{x}{17}} = \sqrt{y^2}$

$\pm\sqrt{\frac{x}{17}} = y$

The inverse will ALWAYS be a reflection over the line $y=x$.

③ Rewrite as $f^{-1}(x)$.

$f^{-1}(x) = \pm\sqrt{\frac{x}{17}}$

2. Determine the equation for the inverse function of $y = (x-4)^3 + 9$.

[A] $y = \sqrt[3]{x-13}$ [B] $y = \sqrt[3]{x-9} + 4$ [C] $y = \sqrt[3]{x+4} - 9$ [D] $y = \sqrt[3]{x} - 5$

① Switch x and y

$y = (x-4)^3 + 9$

$x = (y-4)^3 + 9$

② Solve for y

$x = (y-4)^3 + 9$

$-9 \quad -9$

$\sqrt[3]{x-9} = \sqrt[3]{(y-4)^3}$

$\sqrt[3]{x-9} = y-4$

$+4 \quad +4$

$\sqrt[3]{x-9} + 4 = y$

Notice this 4 stays outside the radical.

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3. Find the equation of the inverse of $f(x) = \frac{5x-9}{6}$.

[A] $f^{-1}(x) = 5x-6$

[B] $f^{-1}(x) = \frac{6x+9}{5}$

[C] $f^{-1}(x) = \frac{6x-9}{5}$

[D] $f^{-1}(x) = \frac{6}{5x-9}$

① Switch x and y

$y = \frac{5x-9}{6}$

② Solve for y

$6x = \frac{5y-9}{6} \cdot 6$

$6x = 5y - 9$

$+9 \quad +9$

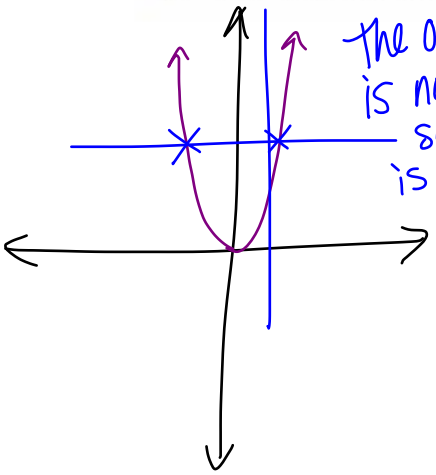
$\frac{6x+9}{5} = \frac{5y}{5}$ Everything is divided by 5.

$\frac{6x+9}{5} = y$

③ Rewrite as $f^{-1}(x)$

$f^{-1}(x) = \frac{6x+9}{5}$

4. Find the inverse of $f(x) = 11x^2$. Determine if the inverse is a function.



the original is not one-to-one so the inverse is not a function.

① Switch x and y

$y = 11x^2$

$x = 11y^2$

② Solve for y

$\frac{x}{11} = \frac{11y^2}{11}$

$\pm\sqrt{\frac{x}{11}} = \pm\sqrt{y^2}$

$\pm\sqrt{\frac{x}{11}} = y$

③ Rewrite as $f^{-1}(x)$

$f^{-1}(x) = \pm\sqrt{\frac{x}{11}}$